REMARKS

Applicants gratefully acknowledge Examiner Harris and Primary Examiner Bernatz for courtesies extended during a telephone interview dated August 28, 2009, including co-inventor Dr. Newns. During this interview, the Examiners shared their thoughts on how the claims could be improved to more precisely define the invention.

The claims have been amended above to clarify the points discussed during this telephone interview.

Claims 1, 6-9, 16, 19, 20, and 22-26 are all of the claims currently pending. Claims 2-5, 10-15, 17, 18, 21 and 27 are canceled, including non-elected claims that were previously withdrawn and are now canceled to attempt to expedite prosecution.

Claims 1, 6-9, 16, and 19-26 stand rejected under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the written description requirement, and claims 1, 6, 9, 16, 19, and 22 stand rejected under 35 U.S.C. § 112, second paragraph, as allegedly indefinite. As per discussion during the above-referenced telephone interview, the claims have been amended in a manner believed to fully address the Examiner's concerns and Applicant respectfully requests that the Examiner reconsider and withdraw these rejections.

Claims 1, 6-9, 16, and 19-20 stand rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over US Patent 6,642,539 to Ramesh et al., although it appears that the Examiner intended to include all current claims in this rejection.

This rejection based on Ramesh is again respectfully traversed in the following discussion.

I. THE CLAIMED INVENTION

As described, for example, in independent claim 1, the claimed invention is directed to a storage medium including a metallic underlayer. A ferroelectric data layer covers the metallic underlayer and serves as a layer for storing information as bits defined by a sign of polarization of domains within the ferroelectric data layer. Each polarized domain comprises a volume dipole polarization within the ferroelectric data layer and includes an area of bound charge on and adjacent to a surface of the ferroelectric data layer. A layer covers the ferroelectric data layer and has a charge migration rate faster than a charge migration rate of

the ferroelectric data layer, thereby providing a charge dissipation of mobile surface charges on the ferroelectric data layer surface while still permitting the polarized domains to be read.

As explained at lines 11-17 of page 2 of the specification, no solution has yet been found to the surface depolarization problem that plagues the art of ferroelectric disk technology using vertical polarization of an FE surface, as explained in more detail beginning at line 22 on page 6, wherein is described a slow loss of surface polarization over several to 24 hours time scale. The inventors recognized that this effect was due not to loss of bulk polarization in the FE film but to accumulation of mobile surface charges which neutralize the bound charges constituting the surface polarization.

The claimed invention provides a solution to this recognition of surface polarization, by providing a layer over the ferroelectric data layer that has a charge migration rate that is faster than the charge migration rate of the ferroelectric data layer and thereby protects against this surface depolarization of the polarized domains.

II. THE PRIOR ART REJECTION

The Examiner continues to allege that Ramesh renders obvious the present invention as defined by claims 1, 6-9, 16, 19, and 20. Applicants again respectfully disagree and again respectfully submit that the rejection of record fails to establish a *prima facie* rejection, based on the Examiner's explanation provided in the latest rejection, wherein the Examiner provides an indication of the intended layers of Ramesh considered to be significant in the Examiner's prior art evaluation.

To begin with, Applicants gratefully acknowledge Examiner Harris for finally providing an indication on page 3 of the Office Action mailed on January 29, 2009, as to the basis for the rejection of record, since, as Applicants have repeatedly pointed out, Ramesh is directed to an entirely different memory technology using a transistor/ferroelectric memory capacitor to form the basic memory cell unit.

In contrast, the memory cell unit of the present invention uses polarized domains in the upper surface of a ferroelectric data layer. The present invention will provide far higher storage density than capable with the technology described in Ramesh. That is, as described at line 14 of page 5 of the specification of the present application, the present invention is projected to be capable of 3000 Gb/in^2 (Gigabits per square inch) => 0.215×10^{-3} μm^2/bit. In contrast, the ferroelectric RAM, based on a transistor/ferroelectric capacitor, is described on

Wikipedia.org as having a typical cell size of 0.22 μm^2, when using the 90 nm process for fabrication. Thus, as a first approximation, and assuming Applicants' representation has calculated correctly, the technology of the claimed invention is roughly three orders of magnitude better in density from that used in Ramesh.

As explained at lines 20-21 of page 6, the problem being addressed by the present invention is that the inventors recognized there to be a slow surface depolarization of the polarization-written information described in their previous patent, US Patent 6,515,957. As explained at the top of page 7, the inventors were able to discover that this slow loss of surface polarization was not due to a loss of bulk polarization in the FE film, but, rather, was due to accumulation of mobile surface charges which neutralize the bound charge constituting the surface polarization.

The solution offered by the present invention is that of providing an overlying conducting layer (e.g., layer 211 shown in Figure 2), thereby shielding against this depolarization. In an exemplary embodiment, the conducting layer directly contacts the ferroelectric data layer.

Therefore, the type of ferroelectric memory of the present invention is entirely different from the ferroelectric memory cell used in Ramesh, even if there are some co-incidental similarities in some materials of some layers. That is, there is nothing in Ramesh that corresponds to the structure 210 shown in Figure 2 of the present application and as described in the independent claims. Absent such demonstration of corresponding structure, the rejection clearly fails to establish a *prima facie* rejection.

Turning now to the rejection currently of record for independent claims 1 and 16 and to the Examiner's figure on page 4 of the Office Action, the Examiner considers that layer 70 corresponds to the metallic underlayer of the claimed invention, Si layer 72 corresponds to the conductive layer of the claimed invention, and STNVO layer 63 corresponds to the ferroelectric layer of the claimed invention.

However, Applicant submits that this matching of layers fails to satisfy either the layer relationship described in the independent claims and certainly fails to satisfy the functional language for the layers of the claimed invention.

That is, in the Ramesh configuration, the metallic barrier layer 70 is between the conductive layer 72 and the STNVO layer 63. The claimed invention clearly requires that the layers be arranged so that the conductive layer be over the ferroelectric data layer which is over the metallic underlayer. The Ramesh configuration of layers clearly fails to satisfy the

plain meaning of the description required in the two remaining independent claims.

Moreover, the memory device of Ramesh is not based on the polarized domains described by the independent claims. Rather, the memory cell unit is shown in Figure 7 and requires an entirely different principle of operation from that described in the functional description of the ferroelectric layer component of the claimed storage device.

Finally, it is noted that, during the above-mentioned telephone interview, the Examiner again made passing reference to "intended use" as a potential barrier to patentability of the claimed invention, since the Examiner considers that similar materials are used in the cited reference, thereby, according to the Examiner's intended invocation of "intended use", the cited reference should be considered as inherently providing the structure described in the claimed invention.

As Applicant pointed out in the telephone interview, the "intended use" rationale applies only for an anticipation rejection for an entire apparatus claim where the claimed structure is found in the prior art that reads on the structure of the claimed apparatus but differs only in its intended use. The "intended use" rationale does not, however, apply for functional language that describes a component within a device or apparatus. Such functional language for components within a structure must be analyzed in view of the plain meaning of the language of that claim limitation.

Thus, in the present evaluation, the memory cell of Ramesh is based upon a different principle of operation (e.g., a transistor/ferroelectric memory capacitor) from that of the claimed invention. Accordingly, there clearly is no component in Ramesh that serves to store data as polarized domains, as required by the functional language of this claim limitation. Stated slightly differently, the technology and principle of operation of the present invention is drastically different from those of Ramesh, even if there is some commonality of materials.

Hence, turning to the clear language of the claims, in Ramesh there is no teaching or suggestion of a: "… storage medium, comprising: a metallic underlayer; a ferroelectric data layer over said metallic underlayer, said ferroelectric data layer serving as a layer for storing information as bits defined by a sign of polarization of domains within said ferroelectric data layer, each polarized domain comprising bound charges in a first portion of bound charges within said ferroelectric data layer and a second portion of bound at a surface of said ferroelectric data layer; and a layer over said ferroelectric data layer having a charge migration rate faster than a charge migration rate of said ferroelectric data layer, said layer over said ferroelectric data layer providing a charge dissipation of mobile surface charges on

said ferroelectric data layer surface while still permitting said polarized domains to be read", as required by independent claim 1. The remaining independent claim has similar corresponding language.

Therefore, Applicants again respectfully submit that there are features of the claimed invention that are not taught or suggested by Ramesh, and the Examiner is respectfully requested to reconsider and withdraw this rejection based on Ramesh.

III. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 1, 6-9, 16, 19, 20, and 22-26, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. All other claims have been canceled in an attempt to expedite prosecution. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Assignee's Deposit Account No. 50-0510.

Respectfully Submitted,

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